EXHIBIT A

Bishop – Tire Report

I was asked to examine a Dunlop D402 Harley Davidson, serial # DAF4 M17M 3107, rear motorcycle tire (subject tire), and to determine the cause of its failure. My observations and opinions are outlined in the following report. All of these opinions are based on my education, experience, training, skills, knowledge, and a review of the items and documents in this case. All of my opinions are based on a reasonable degree of scientific and engineering certainty.

Background

On 08/01/2010, Mr. Otto Floto Bishop was operating a 2006 Harley Davidson FLHTC-UI, VIN 1HD1FCW116Y65468 (subject Motorcycle) westbound on Interstate Highway 90, near milepost 127 in Jackson County, South Dakota. Lisa Bishop was riding as a passenger. Suddenly, the rear tire catastrophically failed, causing the operator to lose control of the motorcycle and crash. The crash resulted in serious injuries to the operator and passenger.

Items Reviewed or Examined

- Dunlop D402 Harley Davidson, serial # DAF4 M17M 3107, rear motorcycle tire (subject tire)
- T16X3.00D castalloy rear wheel, (subject wheel)
- Dunlop D402F Harley Davidson, serial # DATR M21M 0206, front motorcycle tire
- T16X3.00D castalloy front wheel
- Plaintiff's Initial Disclosures
- Plaintiff's Answers, Responses and Objections to Defendant's First Set of Interrogatories and Requests for Production, with Exhibits
- Confidentiality Protective Order
- Numerous Documents supplied by Goodyear Dunlop under terms of the Protective Order
- South Dakota Traffic Accident Report, written by Deputy Tim McNutley
- Numerous Records for Subject Motorcycle
- Numerous Photos of the Accident Scene

Education, Training, and Experience

- B.S. Physics from Michigan State University
- 25 Years at Uniroyal & Uniroyal Goodrich Tire Company
  I have extensive experience in all areas of tire manufacturing, including failure analysis. I worked for Uniroyal for 25 years and have been steadily involved with tires for 40 years. During my time with Uniroyal, I held a number of positions, including Director of Product Evaluation and Manager of Testing Services which included responsibility for all testing and tire failure analysis for all manufacturing, research and development company wide. I am a Past President of the Tire and Rim Association, Past Chairman of the Tire Engineering Policy Committee for the Rubber Manufacturers Association and the current Chairman of the Highway Tire Committee of the Society of Automotive Engineers. Beyond my experience in tire design and construction, my broad and thorough background in tire evaluation has provided me with extensive expertise in overall tire design, construction, and materials. As an effective evaluator, I provided the oversight and judgment as to the ultimate effectiveness of the tire design, construction, and materials. Furthermore, because of my understanding and articulation of tire technology, I have led numerous industry efforts relating to tire technology advancements and tire standards.

- 30 Years of Training and Participation in Accident Investigation
  I teach traffic accident investigation classes, involving tires, and have done so for 25 years. Michigan State University's Highway Traffic Safety Program is one of the premier training organizations in the USA that offers a long-term coordinated, comprehensive series of traffic crash training programs. Several thousand Michigan officers have taken these courses at locations statewide.

- 14 Years at an Independent Automotive Testing Company
  I was owner & President of a company, dedicated to serving the automotive industry and focused on testing services. Employment exceeded 100 people, with an annual sales volume of over $5 million. Services included quality/durability/reliability evaluations and tire examinations, including failure analyses.

Description of Subject Tire Failure

The failure mode in the tire was a run-soft failure, resultant from extreme and abnormal over-deflection of the tire, while running at its operating load and normal highway speeds. This produced intense heat and severely elevated temperatures in the tire from the over-deflection. Temperatures in these regions of the tire reached the melting point of the polyester carcass ply cords. The subject tire also experienced a massive series of separations and fatigue fractures at multiple interfaces near the regions of the melted carcass ply cords. This produced a massive circumferential opening along the serial side (SS) shoulder region of the tire.

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Cause of the subject Tire Failure

The cause of the over-deflection was under-inflation. The cause of the under-inflation was a slow loss of inflation pressure, which occurred over a period of time while running during the last trip and prior to the accident. This air pressure loss resulted from leaks between the tire bead and the rim flange. These leaks were caused by 2 types of manufacturing defects in the subject tire:

- Non-fill of rubber in the region of the bead heel
- Toe ring flash on the bead face

In a recent deposition of a corporate representative from Goodyear Dunlop Tire North America (GDTNA), a question arose as to whether the measurements of the toe ring flash represented a manufacturing defect. If the permissible tolerances for toe ring flash are correct as written in the GDTNA documents, the toe ring flash in the subject tire is a manufacturing defect. If such permissible tolerances in the written document are not correct but instead are what was claimed at the deposition, then the toe ring flash on the subject tire is a design defect.

In addition the following design defect was a contributing factor:

- Insufficient skim rubber thickness over the chafer fabric in both the SS and OSS beads

Such manufacturing defects in a finished tire are readily and immediately visible upon visual inspection at the tire factory. Its nature and appearance, as well as its consequences, are well understood. The subject tire should have been either repaired or scrapped at the factory.

At the onset of my review of the evidence, I performed an analysis as to whether the failure in the subject tire was due to abuse on the part of the owner. There was no significant evidence on the subject tire which would indicate abuse. The forms of abuse considered were:

- Impact Damage
  Other than what occurred during the crash sequence, there were no significant cuts, tears or bruises on the subject tire, which would have indicated that the tire had impacted an object during its useful life. There was nothing found on the tire to suggest any prior impact damage. Accordingly, impact damage was ruled out.
- Improper Repair
  The subject tire was neither punctured nor repaired prior to the failure. Accordingly, a puncture and an improper repair were ruled out.

Physical Examination of the Subject Tire

The subject tire, mounted on the subject wheel, was received in Saline, Michigan, on or about 11/15/2010. The size is MU85B16 M/C 77H, Load Range C. It was marked as a tubeless tire. Its maximum load carrying capacity was 908 pounds, at a maximum inflation pressure of 40 PSI. The subject tire had a bias belted construction, with a 3 ply polyester carcass and 2 fiberglass belts. Its serial number indicated that it was manufactured during the 31ST week of 2007, at Dunlop Tire Corporation, P.O. Box 1109, Buffalo, NY 14240[2].

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Tread groove depth measurements varied from 5/32” to 6/32” in the SS grooves, from 5/32” to 6/32” in the center grooves, and were 6/32” in the OSS grooves.

The major failure area was in the 8:15 – 12:30 circumferential region. The failure consisted of a massive circumferential opening, more or less along the SS shoulder, with broken, melted, and necked down polyester carcass ply cords protruding throughout the opening. Massive separations at numerous interfaces also existed in the region of the major failure. This circumferential orientation of the opening was consistent with the radial location of the “folding” in the upper sidewall and shoulder under conditions of very severe deflection. In this region of the opening, many of the polyester bias ply cord ends were melted and “necked down” to pointed ends, indicative of cord tension and therefore inflation pressure prior to melting.

Upon demounting, it was discovered that there was very severe toe ring flash, at the mold junction, at numerous circumferential locations, along a ring located approximately ¼” up the bead face from the bead heel on the SS bead. The flash widths reached 0.136”, lengths reached 3.16”, and thicknesses reached 0.006”. This condition of toe ring flash compromises the air seal function necessary for a tubeless tire.

In both bead regions (SS & OSS), there were numerous places of medium non-fill, located primarily at the bead heel. A distinguishing feature of this condition is that it contains a series of uniformly spaced, circular beads of rubber, each with the appearance and approximate size of a head of a common pin. This corresponds to the density of the cross woven fabric in the chafer. The non-fill lengths reached 4.2” in the SS bead and 2.4” in the OSS bead. This condition of non-fill also compromises the air seal function necessary for a tubeless tire.

In both the SS and OSS beads, the impressions of the square woven chafer fabric were easily visible through the chafer skim rubber. This condition can also create a contributing factor in an unsatisfactory air seal in this region. These defects are shown in Figure 1.

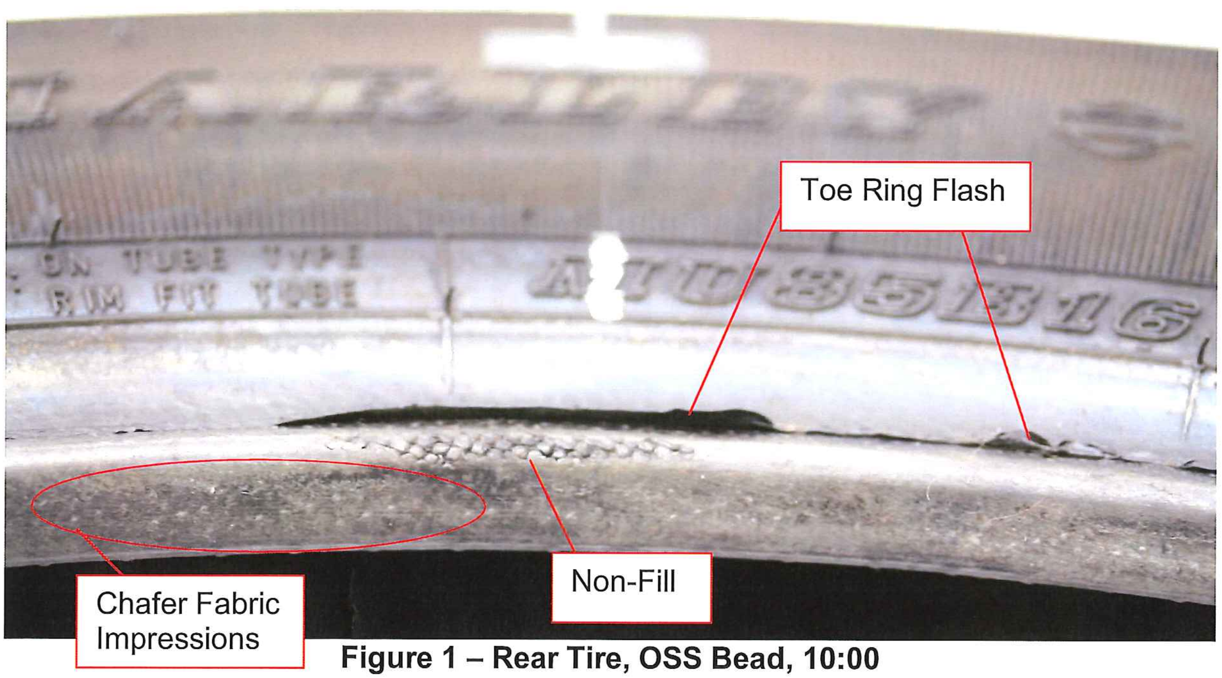

Figure 1 – Rear Tire, OSS Bead, 10:00

An example of a Dunlop motorcycle tire, made in Japan, showing a total absence of any chafer fabric impressions in the bead rubber is shown in Figure 2.

Figure 2 – "Dunlop Qualifier" 150/90-15 Motorcycle Tire

Physical Examination of the Rear Wheel

The wheel was Harley Davidson brand, cast aluminum alloy, size T16X3.00D. It was also marked, "suitable for tubeless tire".

The TR412 tubeless, snap-in valve was fitted to the rim, along with a valve cap. The valve core was tight. A simple back pressure check of the valve revealed no leakage at the valve core and core chamber.

Rim Bead Seat Diameter Measurement and Inspection

To confirm that each bead seat on the subject wheel rim was within tolerance, a 16" m/c disk tape from the Tire and Rim Association[1] was used. Each bead seat was found to be centered at the tolerance for a D rim, which also puts it at the very minimum diameter, albeit within tolerance for an MT rim. This minimum value in bead seat diameter leads to the most adverse condition within the tolerance range for an air pressure seal in a tubeless tire.

Physical Examination of the Front Tire and Wheel

The front tire and wheel were examined in Saline, beginning on or about 04/18/2014. The size is MT90B16 M/C 72H, Load Range B. It was marked as a tubeless tire. Its maximum load carrying capacity was 783 pounds, at a maximum inflation pressure of 40 PSI. This higher pressure is optional and permissible via the Tire and Rim Association Standard, which specifies a pressure of 36 PSI for such a Load Range. The subject tire had a bias belted construction, with a 3 ply polyester carcass and 2 fiberglass belts. Its serial number indicated that it was manufactured during the 2nd week of 2006, at Dunlop Tire Corporation, P.O. Box 1109, Buffalo, NY 14240[2].

Tread groove depth measurements were 5/32" in the SS and 0SS grooves, and 3/32" in the center grooves. The inflation pressure at the time of inspection was 18 PSI.

The front tire was demounted on 05/23/2014. There was toe ring flash on the OSS bead, with thicknesses reaching 0.018", widths reaching 0.115", and lengths reaching 0.448". Non-fill and chafer fabric impressions were negligible in the bead rubber.

The wheel was Harley Davidson brand, cast aluminum alloy, size T16X3.00D. It was also marked, "suitable for tubeless tire".

Mechanics of a Separation and Run Soft Failure

A tire is a laminate, similar to a piece of plywood. In a tire, these laminated layers consist of "plies" of cord material, along with several layers of different types of rubber. If a tire is to structurally fail, a common failure mode is a delaminating of two or more of these layers, just as with a piece of plywood. When such a delaminating process occurs with a tire, it is called a "separation".

This separation emerges from 5 influences: 3 stresses (load, inflation pressure, and speed), plus heat and oxygen. When an inflated tire is loaded, a critical shear stress emerges in the belt rubber and ply rubber. Higher speed increases the stress, due to the increased rate of flexing (cycles/second), as well as the increased centrifugal force. This is compounded by the higher temperatures resulting from these stresses, since rubber adhesion and strength decreases with increasing temperature. Last, but not least, rubber ages from an oxidation process. The source of the oxygen is the tire inflation pressure, which permeates past the carcass and belts at the rate of 1-2 PSI/month at normal inflation pressures. This slowly but steadily deteriorates the rubber, and reduces its strength and adhesion. Furthermore, the rate of oxidation increases with increasing temperature.

The aging of rubber via this oxidation process has been widely acknowledged and understood. The issue of tire aging has received even greater attention in recent years, as a result of the TREAD act and the emergence of FMVSS 139. The tire industry has told NHTSA that, while there are many aging mechanisms acting on a tire, there are only 2 that really matter[11]. One of them is chemical aging, which involves changes in tire rubber due to heat and oxygen interactions. In fact, the oxygen permeation into the area in the shoulder region of the tire is what really matters. Furthermore, this is time dependent. The other aging mechanism involves changes in rubber due to mechanical stress/strain. Since the area in the shoulder region has the highest stress/strain, mechanical aging effects are the greatest in this area. This type of aging is dependent on the number of cycles of stress/strain (flexing).

This most vulnerable region for a tire to separate is the shoulder (where the sidewall meets the tread). It's the area of the greatest stresses and strains (the highest strain energy density) at normal loads, inflation pressures, and highway speeds. Correspondingly, it's the area where the greatest heat is generated, and the highest temperature exists, with a normally inflated tire, rolling while supporting a load, and "flexing" (deflecting) when that respective portion of the circumference comes into contact with the road. At normal highway speeds, this flexing/relaxing occurs at the rate of 10-15 cycles/second.

This vulnerable shoulder region becomes even more critical in a motorcycle tire when it experiences severe over-deflection. The amplitude of the flexing cycles increase dramatically, producing a double pronged effect: decreasing the fatigue life and dramatically increasing the temperature of the material. This sets up a separation process, which typically proceeds through the rubber between the plies, wherein the greatest amount of flexing (strain energy density) is located. This over-deflection leads to an intense build up of heat as the tire is run at normal loads and normal highway speeds. With a rolling tire producing 12-15 revolutions per second at those speeds, the folding and unfolding occurs at the same cycles per second. The heat tends to be localized at the fold and hinge points, given the superior insulating properties of rubber. This causes the temperatures to rise to the melting point of the cords, as well as to the chemical reversion of the rubber. As these cords fatigue and melt, the tire typically comes apart before the air pressure reaches zero PSI, resulting in rapid air loss (blowout) of the remaining air pressure. The fact that some of the melted cord ends were necked down to a point confirms that the cords were in tension when they melted. If the cords were still in tension, the tire was still pressurized, however low it might have been.

Discussion of Load Conditions

The subject motorcycle is a 2006 Harley Davidson FLHTCUI, with a gross vehicle weight rating (GVWR) of 1259 lbs. and a curb weight ("vehicle weight in running order") of 819 lbs. This results in a "payload' rating of 440 lbs. Otto Bishop weighed 280 lbs., Lisa Bishop weighed 170 lbs., and approximately 20 lbs. were in the saddlebags, representing a total payload of 470 lbs.

In the event that load (and overload) can possibly become an issue in this case, the results of an exemplar load/inflation/ deflection study are of value to attach a perspective to the issue.

An exemplar touring motorcycle was weighed under various conditions of simulated load. In addition, detailed tire pressure and deflection measurements were taken at the various load conditions. The motorcycle was fitted with a rear tire having a rated load of 908 pounds.

Tire operating temperatures at a given operating speed are primarily dependent upon deflection. Therefore, a key purpose of these measurements was to determine the various pressures that would result in equivalent deflections at the three key loads: less than rated load, rated load, and overload.

It was found from these precise measurements that, when the tire was inflated to 10 PSI and loaded to 827 lbs, for example, it experienced the same deflection as it would when inflated to 11 PSI and loaded to 908 lbs. (tire rating), and when inflated to 13 PSI and loaded to 976 lbs. (overload). The test results are shown in Table 1.

Driver Ballast	Passenger Ballast	Front Tire Load	Rear Tire Load	Rear Tire Pressure	Rear Tire Deflection
-	-	40	4	40	0
-	-	99	101	40	0.15
0	0	369	485	40	0.54
0	0	369	485	30	0.65
-	-	172	214	40	0.29
304	282	461	975	40	0.71
304	282	460	976	30	0.83
304	282	459	977	20	1.1
304	282	457	978	10	1.5
304	282	455	978	5	1.9
304	282	450	981	0	2.25
304	228	476	908	40	0.89
304	282	461	976	40	0.92
304	282	461	976	30	1.02
304	228	481	908	30	0.99
304	228	481	908	20	1.21
304	282	480	976	20	1.25
304	282	460	976	10	1.7
304	228	478	908	10	1.59
304	228	477	908	5	2.06
304	282	460	976	5	2.12
304	282	460	978	40	0.9
304	133	466	827	40	0.84
304	133	466	826	30	0.89
304	133	464	827	20	1.1
304	133	460	827	10	1.52
304	133	460	827	5	1.96

Table 1 – Static Load, Inflation, Deflection Test Results

This study proved that any possible overload at issue in this case would have had a negligible effect on the inflation pressure necessary for the catastrophic failure in the subject tire. Furthermore, FMVSS 119 requires that such a motorcycle tire be durability tested at loads reaching 117% of the rated load and not fail[14].

Furthermore, whereas the gross vehicle weight (GVW) of the subject motorcycle, at the time of the catastrophic tire failure and crash, may have been slightly higher than the gross vehicle weight rating (GVWR) stated by the vehicle manufacturer, the respective load on the rear tire did not exceed the maximum load rating for this tire size. This is based on the extensive data captured on motorcycles at rallies. For examples involving the same make and model motorcycle, and under heavily loaded conditions (i.e., near and occasionally exceeding the GVWR), precise weighing has revealed that approximately 2/3 of the total gross weight on such a motorcycle is on the rear wheel. Therefore, using the curb weight of 819 lb., combined passenger weight of 450 lb., and saddlebag weight of 20 lb., the resultant gross weight is 1289 lb., 2/3 of which is 860 lb., which is less than the maximum load rating of 908 lb. for the subject tire.

Temperatures Associated with the Catastrophic Failure

As indicated, the failure consisted of a massive circumferential opening, more or less along the SS shoulder and upper sidewall, with broken, melted, and necked down polyester carcass ply cords protruding throughout the opening. The existence of melted polyester cord ends confirms that tire temperatures exceeded 482°F, which is the melting point of polyester tire cords. This necessitates an extremely low inflation pressure, in order to accomplish the extreme over-deflection that would lead to such extreme temperatures.

Dynamic Testing

To confirm the relationships of load, pressure, speed, and tire temperature, and to prove that any reasonable combination of normal operating conditions do not produce tire temperatures that are anywhere close to the melting point of polyester tire cords, a series of dynamic tire tests were run. This was done at Independent Test Services, located in Canton, Michigan. This company was founded, and is owned and operated by Kenneth Archibald. It is an industry leader in wheel testing and analysis capabilities.

The test was conducted on an indoor roadwheel with a smooth steel surface and a diameter of 67.23", which represents the conventional test equipment for FMVSS as well as numerous voluntary standards.

A new exemplar tire, of the adjacent size, with the same brand and factory code was procured. A new exemplar wheel, having the same features as those in the subject wheel, was also procured.
The test room temperature was maintained to approximately 75°F, the tire was initially inflated to 40 PSI cold, and the initial test speed was set at 50 MPH.

Three loads were chosen, in the following sequence:

- 635 lbs., representing an approximate 23% reduction from the rated load
- 827 lbs., corresponding to the maximum rated load
- 1019 lbs., representing an approximate 23% overload

Dynamic temperatures of the upper sidewall at the outer surface of the tire were continuously monitored, using a non-contacting, infrared sensing device. This radial location on the test tire corresponded to the approximate location of the catastrophic failure in the subject tire.

The resultant equilibrium, steady state tire temperatures and built up pressures were as follows:

- 88.5°F and 45 PSI at the light load
- 94.5°F and 47 PSI at the rated load
- 101.0°F and 48 PSI at the overload

The inflation pressure was then reduced by 10 PSI. The results were as follows:

- 93.5°F and 37 PSI at the light load
- 100.5°F and 38 PSI at the rated load
- 108.0°F and 39 PSI at the overload

Finally, the speed was increased to 70 MPH, while running at the overload condition and 10 PSI below the rated cold inflation pressure. The results were 108°F and 40 PSI.

These dynamic test results confirmed that, even at severe overload and foreseen highway speed conditions, together with significant reductions in pressure, the running tire temperatures do not come close to the temperatures necessary to produce the catastrophic failure in the subject tire. The pressure in the subject tire had to have dropped to an extremely low value and much lower than the reductions undertaken in this dynamic test.

Tire Bead & Wheel Rim Leakage

A tubeless tire relies on intense pressures of the tire bead region against the wheel rim flange to form an effective air seal. The effective diameter of the bead base on the tire is slightly smaller than the effective diameter of the bead seat on the rim, thereby producing an interference fit. The small rim bead seat diameters (at the very minimum of the tolerances) will necessarily reduce this interference fit. A similarly tight fit exists around the bead heel and up the bead face to the rim flange height, which come into play primarily when the tire is inflated and loaded. These dimensions are critical, the tolerances are tight, and even small abnormalities on either the tire or the rim can compromise this air seal.

For example, even the slightest corrosion in the bead seat or bead seat radius of the rim flange can lead to persistent leakage. The corrosion issue associated with aluminum wheels and tubeless tire is well understood and routinely faced in the marketplace. This is effectively illustrated in General Motors Technical Bulletin 08-03-10-006C. In it, they acknowledge that "abrasive elements in the environment may intrude between the tire and the wheel at the bead seat"[13]. The consequence can be a condition where "eventually a path for air develops and a 'slow' leak may ensue". Similarly, any damage or blemishes in the tire bead region can have similar, adverse effects.

Rubber typically hardens with age. Therefore, when the tire is new, the potential exists for the rubber to be soft enough to overcome these defects and produce an adequate air seal. However, as the tire ages and the rubber hardens, it becomes less capable of enveloping these disruptions in the air seal, and the leakage increases. In addition, the hot running temperatures in a tire, together with warm ambient temperatures, accelerate this aging and hardening process of the rubber.

The increased leakage associated with the hardening of the rubber is not necessarily linear with time. Rather, it can experience a "stick/slip" phenomenon, wherein the air loss rate is suddenly increased. This sudden deterioration in the air seal can be further exacerbated when the tire is loaded and running. The very small, normal movements of the tire bead in the rim flange can eventually lead to the sudden inability of the tire bead rubber to overcome these defects. Likewise, when the motorcycle is parked and only partially loaded, these leaks can be diminished. This can lead to a "static" air seal but a "dynamic" leakage.

These principles of load distribution and variation were confirmed with actual tests in the SAE Paper, *Bead Contact pressure Measurements at the Tire-Rim Interface"*. The authors found that "considerable unloading can occur on the bead seat between the tire heel and toe during passage through the footprint region"[12]. They went on to report that "unloading can occur to such an extent that tire-to-rim contact can be momentarily lost".

Screening and Remedies for such Manufacturing Defects

All finished tires are visually inspected for numerous defective or inferior conditions, including non-fill in the bead region and toe ring flash. When these types of conditions exist in the bead regions of tubeless tires, they must be treated very seriously, for the above mentioned reasons.

The toe ring flash should have been trimmed off at the factory, or else the tire should have been scrapped. Similarly, the remedy for a tire for non-fill in the bead region is to fill the voids or else scrap the product.

The distinct, beveled appearance at each bead toe is consistent with toe flash having been trimmed from the subject tire. If indeed that is the case, then the tire was obviously inspected, but the toe ring flash and non-fill conditions were blatantly ignored or overlooked in the inspection and repair process.

Motorcycle Dynamics Associated with a Run Soft Failure

The forensically examined evidence confirms that the catastrophic failure of the subject tire involved a blowout, albeit at an extremely low pressure. A bias (diagonal) ply or bias belted tire can distort this run-soft process, such that it may produce a noticeable and objectionable vibration. This can serve as a warning to the operator, thus producing the opportunity to bring the vehicle to a safe stop before the catastrophic failure occurs. However, motorcycle engine, pavement surface, and wind noise can collectively conceal the noise and vibration from this tire distortion under such conditions. Hence, the warning may not be noticeable, if it exists at all. The result is that such a tire can be losing its inflation pressure and the operator will not realize it.

This catastrophic failure caused the subject tire to blow out any of its remaining pressure and to flop around violently within the wheel well and frame. This obviously created a terribly difficult situation for maintaining motorcycle control.

There are no facts in evidence to even suggest, much less confirm, that the operator did anything incorrectly to maintain control of the motorcycle. There are no facts in evidence that the operator did anything contrary to what is stated by way of advice and/or instructions contained in any motorcycle owners manual and/or in any motorcycle drivers license booklet.

Any possible overload foreseen or at issue would have had a negligible effect on vehicle control. What dominated and overwhelmed was that the tire had catastrophically failed and was no longer a tire. There are no facts in evidence that any controlled tests were ever performed under such failed tire conditions by the defendants.

Additional Cases involving the Subject Tire Brand and Defects

This case is but one in an alarming array of incidents involving Dunlop brand motorcycle tires manufactured at the Buffalo plant, with defective unreasonably dangerous bead conditions. A brief summary of additional instances is shown below. Due to numerous restrictions, specific case information is omitted.

On 08/07/2009, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in Wyoming. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: MU85B16 77H
Brand: Dunlop D402 Harley Davidson
DOT: DAF4 M17M 2707
Failure Mode: Run Soft

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On 05/17/2002, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in Utah. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: 180/55ZR17 (73W)
Brand: Dunlop Sportmax Touring D205 M Radial JLB
DOT: DA8E MIL 2800
Failure Mode: Run Soft

On 05/25/2008, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in South Carolina. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: MT90B16 74H
Brand: Dunlop D402 Harley Davidson
DOT: DATR M19M 3203
Failure Mode: Run Soft

On 08/04/2008, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in Georgia. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: MU85B16 77H
Brand: Dunlop D402 Harley Davidson
DOT: DAF4 M19M 0808
Failure Mode: Run Soft

On 05/13/2008, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in Georgia. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: MU85B16 77H
Brand: Dunlop D402 Harley Davidson
DOT: DAF4 M18M 3607
Failure Mode: Run Soft

On 08/03/2008, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in Montana. The contributing factor for the loss of control was a defective bead.
Tire Size: MU85B16 77H
Brand: Dunlop D402 Harley Davidson
DOT: DAF4 M18M 0608
Failure Mode: Run Soft

On 03/16/2006, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in South Carolina. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: MU85B16 M/C 77H
Brand: Dunlop D402 Harley Davidson
DOT: DAF4 M18M 4704
Failure Mode: Run Soft

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On 09/20/2003, an operator of a motorcycle with a Dunlop front tire experienced a sudden tire failure while riding in New York. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: 120/70ZR17 74H
Brand: Dunlop D205F Radial Sportmax Touring
DOT: DA8B MJM 0700
Failure Mode: Run Soft & Impact Rupture

On 08/06/2009, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in North Dakota. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: MU85B16 77H
Brand: Dunlop D402 Harley Davidson
DOT: DAF4 M17M 2508
Failure Mode: Run Soft

On 05/08/2007, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in North Dakota. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: MT90B16 M/C 74H
Brand: Dunlop D402 Harley Davidson
DOT: DATR M17M 1305
Failure Mode: Run Soft

On 05/16/2008, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in Washington. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: MU85B16 M/C 77H
Brand: Dunlop D402 Harley Davidson
DOT: DAF4 M18M 2407
Failure Mode: Run Soft

On 08/09/2008, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in Texas. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: 180/60R16 M/C 74H
Brand: Dunlop D250 Radial
DOT: DAQL M24 2202
Failure Mode: Run Soft

On 07/18/2010, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in Alabama. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: MT90B16 M/C 74H
Brand: Dunlop D402 Harley Davidson
DOT: DATR M17M 3604
Failure Mode: Run Soft

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On 07/04/2013, an operator of a motorcycle with a Dunlop rear tire experienced a sudden tire failure while riding in Minnesota. The only reasonable explanation for the failure was a severe drop in pressure caused by a defective bead.
Tire Size: MT90B16 M/C 74H
Brand: Dunlop D402 Harley Davidson
DOT: DATR M17M 3607
Failure Mode: Run Soft

My opinions in this report are subject to modifications or revisions as more information is made available during the course of this case.

Respectfully submitted,

William J. Woehrle

William J. Woehrle

References

[1] *2010 Yearbook of the Tire and Rim Association, Inc.*

[2] *2008 Who Makes it and Where Tire Directory*, a Bennett Garfield Publication

[3] The Pneumatic Tire, Joseph P. Walter, Editor

[4] Mechanics of Pneumatic Tires, Samuel K. Clark, Editor

[5] Brico, Jean-Claude, *Abnormal Wear,* ITEC 2004 Paper 20

[6] Brico, Jean-Claude, *Bead Compression Grooving: Characteristics and Influence of Tire Deflection,* ITEC 2004 Paper 44

[7] Baldwin, John M. *Tire Aging Update*, ITEC Presentation, September 12, 2006

[8] Schnuth, C. L., Fuller, R. L., Follen, G. D., Gold, C. G., and Smith, J. M., *Compression Grooving and Rim Flange Abrasion as Indicators of Over-Deflected Operating Conditions in Tires*, Rubber Division, ACS Paper No. 51, October, 1997

[9] Schnuth, C. L., Smith, J. M., Bolden, G. C., and Flood, T. R., *Effects of Over-Deflection on the Tire/Rim Interface*, ITEC Paper No. 31A, September, 1998

[10] Rimondi, G., *Basic Car Tyre Development Principles*, SAE Paper 890103, 1989

[11] Garrott, W. Riley, *What NHTSA Applied Research has Learned from Industry about Tire Aging,* May 1, 2003 Presentation

[12] Walter, J.D., and Kiminecz, R.K., *Bead Contact Measurements at the Tire-Rim Interface*, SAE Paper No. 750458, 1975

[13] General Motors Technical Bulletin 08-03-10-006C

[14] 49CFR Part 571.119

Tire Forensics Investigations
William J. Woehrle
9922 S. Maple
Saline, MI 48176

C.V. - WILLIAM J. WOEHRLE

OVERVIEW

Experienced **tire testing and evaluation** consultant with a high level of achievement in **automotive testing**. Experienced analyst for all aspects of **tire performance**, including **durability, treadwear, traction,** and **tire/vehicle systems**. **Owner** and **President** of an **Automotive Testing Company** with nationwide operations and worldwide customer base. Recognized leader in the **tire industry standards**.

EXPERIENCE

MICHIGAN STATE UNIVERSITY, HIGHWAY TRAFFIC SAFETY PROGRAMS, ACCIDENT INVESTIGATION & RECONSTRUCTION – TIRE DYNAMICS & EXAMINATION

(1979 – Present)

Developed, and now serve as the **Instructor** for, a one-day course on **Tire Dynamics and Examination,** for law enforcement investigating officers to determine whether a tire failure contributed to an accident and, if so, whether the failure took place before, during, or after the collision. The course also covers the role of tires in vehicle control and handling on dry, wet, snow, and ice covered pavement, as well as unpaved surfaces.

In addition, now serving as an **Instructor** for a 10-day seminar on **Accident Reconstruction, covering various aspects of traffic accident reconstruction, including acceleration, time-distance studies, and determination of vehicle speeds via kinetic energy and conservation of linear momentum.**

Michigan State University's Highway Traffic Safety Program is the only organization in Michigan, and one of the premier training organizations in the USA, that offers a long-term coordinated, comprehensive series of traffic crash training programs. Several thousand Michigan officers have taken these courses at locations statewide.

AUTOMOTIVE ENGINEERING MANAGEMENT SERVICES, INC.

(1992-2005)

Owner & President - Created a new company, dedicated to serving the automotive industry and focused on testing services. Employment exceeded 100 people, with an annual sales volume of over $5 million. Services included quality/durability/reliability evaluations, vehicle mileage accumulation, component and systems evaluation, **tire examinations, and failure analyses.**

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UNIROYAL and UNIROYAL-GOODRICH TIRE COMPANY

(1966 – 1991)

Director, Product Evaluation - Responsible for a department of nearly 200 staff, with a budget of over $8 million to provide corporate-wide **Proving Ground, test facilities, testing services and tire failure analyses**. Managed testing services for entire R&D and manufacturing operations. **Continually evaluated product line against specifications and competition's products**. Developed testing technology to meet and exceed customer and corporate expectations. Directed the construction and facilities improvements resulting in a world class tire traction proving grounds. Led the efforts to **standardize tire test procedures**, involving chairmanships in SAE and ISO. (1987-1991)

Manager Testing Services - Achieved unprecedented value and accuracy for the **tire test department**, through modernizing equipment and setting high standards for quality. (1984 - 1987)

Manager, Industry Standards - Coordinated with other tire companies as well as vehicle manufacturers, testing companies, and government agencies at key industry committees to set **technical standards for tires**. Led industry sponsored tire research and developed **new tire test procedures**. **Analyzed and reported on failed tires to respond to liability claims.** (1978 - 1984)

Automotive Account Engineer - Represented tire company at major vehicle manufacturer to coordinate the meeting of **tire engineering criteria**. **Inspected failed tires that were returned from vehicle manufacturer's qualification tests, and reported analyses to the respective, interested parties**. (1976 - 1978)

Project Manager, Marketing - Developed a program for tire & vehicle service centers to improve the ride and handling quality of vehicles. **Examined failed tires, warranty returns, and addressed customer complaints**. Pioneered in usage of computerized tire/wheel balancers. Organized and ran technical field studies on tires at selected locations nationwide. (1972 - 1976)

Resident Engineer, Laredo, TX Proving Ground - Provided the engineering support for a test center that ran 10 million miles annually, operated 100 test vehicles and employed 200 people. **Examined failed and worn tires that were run on various durability, wear, and hazard tests**. Developed new tire tests. (1969 - 1972)

Development Engineer, Advanced Tire Products - Developed special methods for measuring and analyzing tire/vehicle performance characteristics. **Analyzed failed tires**. (1966 - 1969)

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CONSULTING

Investigated, consulted, and testified, where tires were involved in traffic accidents, in the following states:

- Michigan
- Illinois
- Oklahoma
- Colorado
- New Mexico
- Nevada
- Arizona
- California
- Indiana
- Kentucky
- Missouri
- Utah
- Florida
- Texas
- Pennsylvania
- South Carolina
- Louisiana

Services have been distributed between plaintiff and defendant in civil cases, and prosecution and defendant in criminal cases. Parties have included tire companies, vehicle manufacturers, car dealers, tire dealers, car rental agencies, trucking companies, service stations, and government agencies.

EDUCATION

- BS Physics, Michigan State University, 1966
- Graduate studies for MBA, Texas A&I University
- At least 20 courses in tires, testing, quality, management, via Uniroyal, Univ. of Michigan, etc.

PROFESSIONAL AFFILIATIONS

- **Society of Automotive Engineers (SAE)** – Chairman, Highway Tire Committee
- **Tire and Rim Association (TRA)** – Past President
- **Rubber Manufacturers Association (RMA)** – Past Chairman, Tire Engineering Policy Committee
- **International Standards Organization (ISO)** – Past Chairman, Tire Working Groups
- **Michigan Association of Traffic Accident Investigators (MATAI)** – Member
- **American Society of Testing & Materials (ASTM)** – Member, Committee F9 (Tires)
- **American Trucking Association (ATA)** – Member, Consultant

- **American Chemical Society** – Member, Rubber Division

PUBLICATIONS & PRESENTATIONS

- An Analysis and Evaluation of the Damage and Durability Performance of Steel Belted Radial Ply Tires That Have Experienced Severe Impacts, SAE 2012-01-0795
- Failure Modes of Steel Belted Radial Passenger Tires Which have been Run Over-deflected on a Wheel Fatigue Test, HIFI Paper, Houston, TX, August, 2010
- Invisography – A New Generation of Non-Destructive Tire Testing, HIFI Conference, Houston, TX, August, 2010
- Wheel X-Ray Testing Applied to Tires, HIFI Conference, Houston, TX, August, 2010
- Update on Tires and Tire Issues, MATAI Reference Points, October, 2005
- Update on Tires and Tire Issues, MATAI Fall Conference, 2005
- Accident Investigation 5 – Tire Dynamics and Examination (Training Manual) Michigan State University Highway Traffic Safety Programs (originally published in 1980; frequent updates)
- Tire Involvement in Accident Situations Michigan Trial Lawyers Association Conference (2001)
- Tire Testing Standards SAE (2000)
- Durability Testing in Cold Weather SAE (2000)
- A University/Industry/Government Test Program to Evaluate the Durability Trucks and Pavement Surfaces SAE (1997)
- The History of the Passenger Car Tire in the USA SAE (1995)
- Tire Traction – Matching Product and Test Technologies SAE – USA & France (1989)
- Tire Involvement in Accident Situations SAE (1987)
- A Worldwide Standard for Measuring the Energy Loss in Tires SAE & FISITA (1986)
- Test Procedures for Tire Speed Ratings SAE (1984)
- Test Procedures for Tire Snow Traction SAE (1982)
- Test Procedures for Tire Treadwear ASTM (1980)
- Tire/Vehicle Ride & Handling Service Uniroyal Field Training Manuals (1975)

PERSONAL

- Married, 3 children, 6 grandchildren
- Elder, Presbyterian Church
- Licensed private pilot with instrument rating
- Experienced amateur photographer
- Distance runner (2 marathons)
- Touring Bicyclist (over 10 multiple day trips)

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Professional Fee Schedule – William J. Woehrle

Retainer

- $1000
- To be sent along with initial case information
- Non-refundable, but credited on final invoice

Hourly Rate

- $275/hour
- Applies to all case activities, including document review, examinations, inspections, site visits, travel, report preparation, research and testing activities, preparations and testimony, meetings, and telephone conversations

Expenses

- Actual or estimated out-of-pocket expenses
- Includes transportation, lodging, meals, telephone, photography and printing supplies, copies, shipping, and subcontracting costs

Terms

- Invoices are due upon receipt
- Extended trips are subject to a travel advance
- All charges are the responsibility of the party invoiced
- All charges are not contingent upon the outcome of the case

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Testimony Experience - William J. Woehrle

State	Year	Case	P/D	Attorney	D/M/ H/T	File No.
South Carolina	2014	Cantu v. Sheffield	P	Ronnie Crosby	D	
Michigan	2014	Patel v. Goodyear	P	Kevin Riddle	D	12-0336-NP
Michigan	2014	Slatina vs. Great Lakes Powersports	P	Robert Tyler	D	12-98113-NP
Washington	2014	State Farm & Karpavicius vs. Cooper Tire Co.	P	Eric Thiele	D	12-2-00366-4
Ohio	2013	Fairlamb vs. Accessories Marketing, et al	P	Charles M. Budde	D	CV 2010 08 5415
California	2013, 2014	DeLara v. Sears & Continental	D	Kenneth C. Ward	D/T	11CECG00212
U.S District Court - Illinois	2013	Campbell v. Michelin	P	Bruce Pfaff	D	2011-CV-9097
Washington	2012	Clutchey v. Goodyear Dunlop	P	Greg Samuels	D	09-2-01831-5
New Mexico	2012	Garrett v. Michelin	P	James Ragan	D	D101CV2010 03870
U.S. District Court - Illinois	2012	Martin v. Double Coin	P	Randy James	D/H/ T	3:11-cv-00711-MJR-PMF
U.S. District Court - Alabama	2012	Henderson v. Goodyear Dunlop	P	Richard Morrison	D/H	3:11-cv-000295-WKW
U.S. District Court – South Carolina	2012	Lee/Provence v. Cooper Tire	P	Ronnie Crosby	D	2:11-CV-00806-RMG
U.S. District Court - Illinois	2012	Garrard v. Pirelli	P	Brad Lakin	D/T	5:08-CV-06119
California	2012	Marshall v. WWTMC & Cooper	D	W. Randolph Barnhart	D	RG10521181
California	2012	Robertson v. Rocklin Motor Sports	P	Craig Scheffer	D	34-2010-00088032
U.S. District Court - Texas	2012	Lule v. Nexen	P	T. Rice	D	3:09 – CV 01410-L
Missouri	2012	Beaird v. Community Wholesale Tire	P	Mark Parrish	D	1016-CV13320
Alabama	2012	Ikner v. Clayton	P	Wyman Gilmore	D	CV-2010-900064
Texas	2012	Stricker v. Goodyear Dunlop	P	Billy Edwards	D	D-1-GN-09-003303
U.S. District Court - Louisiana	2012	Pearson v. Michelin	P	Robert Sigler	D	2:11 – cv-00001

Texas	2011	Perez v. Goodyear	P	Wm. Neumann	D	26130
U.S. District Court - Dallas	2011	Phinney v. Continental	P	Windle Turley	D	3:10-cv-01776-P ECF
Arizona	2011	Hemming	P	Kyle Farrar	D	CV2010-012435
California	2011	Padilla v. Pirelli	P	D. Gessell	D	39-2008-00188752-CU-PA-STK
Delaware	2011	Alvarez v. Cooper	P	Brian Beckcom	D	N10C-03-151 JRJ
Louisiana	2011	Milan v. Cooper	P	T. Discon	D	10-CV-2096
Louisiana	2011	Conerly v. Cooper	P	Jennifer Willis	D	08-0967
U.S. District Court - Washington	2011	Sparks v. Pirelli & Harley Davidson	P	Greg Samuels	D	2:10 –CV-01304 JLR
Texas	2011	Jackson v. Gonzales	D	Mike Byrd	D	17,796
Texas	2011	Delgado & Reyes v. Michelin	P	Neil Goro Ben Fields	D	09-10-24676-MCV
U.S. District Court - Texas	2011	Goodwill & Center v. UPS, et al	P	Rod Squires	D/H/T	A-09-CA696SS
Michigan	2011	Boone v. NES Traffic Safety	P	Jim Graves	D/T	06-662-NI
Michigan	2011	Rundell v. Burnout Power Sports	P	Mike Hackett	D	10-900435-NI
U.S. District Court - Kansas	2010	Ho v. Michelin	P	David Harger	D	06:08-CV-1282
Texas	2010	Valerie Myers	P	Bill Zook	D	09-04139-B
U.S District Court - MI	2010	Dow v. Robertshaw	P	Robert Darling	D	1:09-cv-13697-TLL-CEB
Tennessee	2010	Hixon v. Townsend	P	Steve Keyt	M	
Alabama	2010	Turner v. Sure Tire	D	D. Henderson	D	09-cv-2008-900051.00
U.S. District Court - MI	2010	Lee v. Continental	P	Robert Darling	D/M	2:09-cv-13734
California	2010	Novak V. Peralta Auto Center	D	Kevin Cholakian	D	HG07344892
Montana	2010	Gageby v. Goodyear Dunlop	P	Billy Edwards	D	DV-08-480
California	2010	Moreno v. American Tire Depot	D	Bill Delhagen	D/T	JCCP-4160
Texas	2010	Barrientes v. Michelin	P	Luis Cardenas	D	2009CI08493

Texas	2010	Gotthelf v. Goodyear Dunlop	P	John Gsanger	D	2008-43395
Texas	2009	Myers v. Bridgestone	P	Sheetyl Aiyer	D	L-08-0048-CV-A
Texas	2009	Craddock v. Continental	P	A. Karam	D	06-70507

California	2009	Urbina v. Goodyear	P	Steve Doorlag	D	CV07-3705 CAS
Louisiana	2009	Cross & State Farm v. Cooper Tire	P	M. Pearce	D	115,515
Florida	2009	Whitfield v. Cooper Tire Co.	P	R. M. Miles M. J. Walker	D	01-07-CA-2215-K
Illinois	2009	Lopez v. Bridgestone	P	Richard Egan	D	06 L 11806
Illinois	2009	Inman v. Bridgestone	P	Richard Egan	D	07 L 948
Massachusetts	2008	Carreau v. Buell & Harley Davidson	P	Peter Black	D	06 CA 11921 RGS

Nevada	2007	Burnett v. Towbin Nissan	D	Ellen Winograd	D	A476187

Michigan	2006	Zucker v. Mclaughlin Ford	P	Bryan Waldman	D	05-65666-NI

Utah	2006	Johnson v. Goodyear Dunlop	P	Robert Sykes	D	040700421
Michigan	2006	Hupfer v. Discount Tire	P	Steve Goren	D	03-49991-NO2

California	2006	Garcia v. Santa Maria Tire	D	Guy Murray	D,T	CV031186
U.S. ILCD	2006	McCloud v. Goodyear & Dunlop	P	Mark Parrish	D,H T	04-1118
Michigan	2005	Harris v. Pep Boys	P	R. Applebaum	D	03-335831NP

Michigan	2005	Piorkowski v. Lupers, Quality Tire	D	Keith Schroeder	D,T	02-914 NI
Michigan	2005	Vermeersch v. Coop Elevator	P	Bill McHenry	D	03-002203-NI

California	2004	Crane v. Globe Tire	D	Bob Baker & Evette Smith	D	

Michigan	2004	Curtis Ford v. Citizens Insurance	P	Tim Donovan	D	02-1372 NI

California	2003	Hosseini v. Econo Firestone	D	Peter Zell	D	RCV 049707
Michigan	2002	Fitzpatrick v. Bosley Farms	P	Dan Iacco	D	01-06903-NI
California	2002	Dizon v. Hernandez	D	Bob Dean	D	BC 229087

Michigan	2001	Rayner v. Save a Buck Car Rental	P	Bob Best	D	A99-0384-NO
Michigan	2000	National Car Rental	P		D	
Illinois	1999	Zolo v. Uniroyal	D	Chuck Joern	D	92 L 0899
Michigan	1998	Klunge v. Wayne County	D	Bill Mitchell	D	
Michigan	1997	Boyle v. Farmington Hills Chrysler	P	Vince Colella	D	
P/D: Plaintiff or Defense				**D/M/H/T**: Deposition, Mediation, Hearing, Trial		

Updated 06/25/2014